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A large, stylized letter 'A' is the central focus, constructed from a collage of small, rectangular photographs. These photos depict students in various settings: some are working in a control room with multiple monitors, others are in a laboratory with equipment, and some are outdoors. One photo shows a student working on a model of a spacecraft, while another shows a student using a microscope. The background of the entire page is a dark, starry space filled with a large, vibrant, pink and purple nebula or galaxy. The overall theme is science, technology, and student achievement.

National
Aeronautics and
Space
Administration

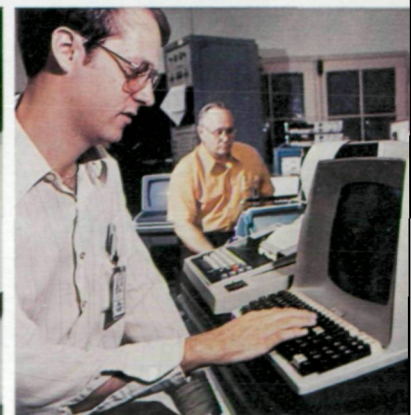
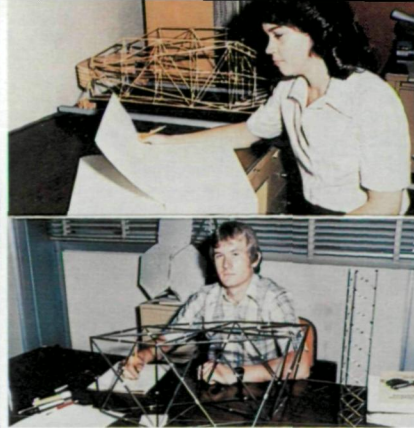
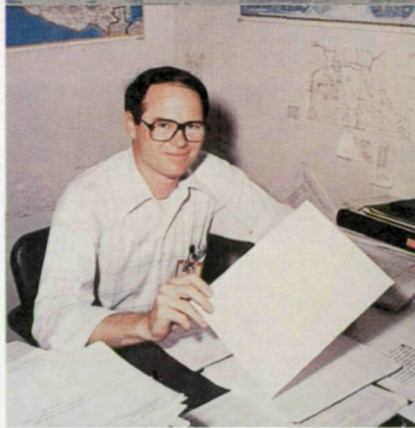
Thousands of people with different talents and interests have found rewarding careers as engineers in the aerospace industry. Many of them began preparing for their careers in much the same way as you -- by reading pamphlets like this one.

On the following pages, you'll meet some of these individuals. They'll share some ideas and suggestions that can help you prepare for an enjoyable and satisfying career as an engineer. With the proper preparation and training, you, too, can enjoy an exciting and successful career.

Mary H. Lewis
Guidance Counselor
Hampton City Schools
Hampton, Virginia

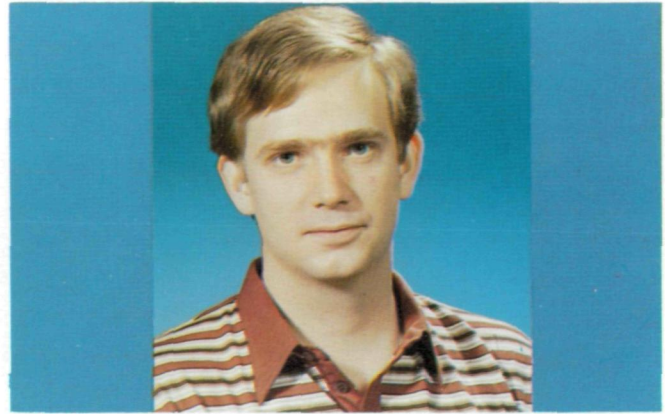
While on assignment with
NASA, Langley Research Center
Hampton, Virginia

Education Services Branch
Academic Affairs Division
National Aeronautics and
Space Administration
Washington, D.C. 1981





My research affects present day and future aircraft for national security.



I'd say that the strongest influence on my choice of a career was my father, who is also an aerospace engineer. He and I enjoyed many pleasurable hours as members of an astronomy club. Many of the other members were also aerospace engineers who served as models for me. When I was a high school student, my goal was to become an astronomer. I decided that astronomy was an unrealistic choice, however, and I switched to engineering, with astronomy as my avocation. Today, my major hobby is the application of photography to astronomy. Once I'd decided that engineering was a more realistic choice, I gained practical, on-the-job experience as an engineering assistant in a summer program sponsored by NASA for gifted and talented students.

As you plan for your career, first determine if you really want to attend college. If so and if you're somewhat uncertain about your future career, it may prove wise to select a college or university that offers a wide variety of majors. Perhaps you can select a more satisfying major once you've had an opportunity to see what fields are available. Seek scholarships and other sources of financial assistance. Don't be intimidated or overwhelmed by the amount of paper work or by the belief that you won't qualify. If you think you know what job you'd like to pursue, invest some time with people working in that job. Do this at the job site, if possible. This is one way to determine what the job actually involves. Be objective – don't ignore or rationalize away the negative aspects of the job. Find out about the average salary, the number of people employed, and typical education and skills required.

Your high school guidance counselor can assist you with career planning. Your counselor and librarian usually have many publications which describe

thousands of different occupations. Two of these are the Dictionary of Occupational Titles and the Occupational Outlook Handbook.

My job as an aerospace engineer affects present day and future aircraft for national security. I work primarily to improve the effectiveness of fighter planes, such as the F-18 Hornet. I carefully study new designs that are "on the horizon." I identify the good points and offer solutions to potential problems. Sometimes I advise engineers from other government agencies and private industries about solutions to particular problems of a given plane. Many times I design new features or modifications which will improve the maneuverability, survivability, and effectiveness of fighter aircraft. For example, a canard, which is a wing on the front of a plane, can help a pilot control the plane against stalls and spins.

I test new design concepts in different ways. I use computers and mathematical models, mainly in the form of a computer-controlled simulator. With the simulator, I can better determine an airplane's characteristics by monitoring a human pilot's reactions during simulated flight maneuvers. Before I use the simulator, I first test a scale model of the aircraft in wind tunnels in order to define its aerodynamic qualities. I then verify the aerodynamics and any new design features by studying a model of the plane as it is dropped from a helicopter and flown by ground-based radio control.

My work is particularly challenging because the material usually goes beyond that taught in college courses. You, too, may find this type of work satisfying.

Mark A. Croom
Aerospace Engineer



The simple step of registering for a Co-Op program became a turning point in my life.

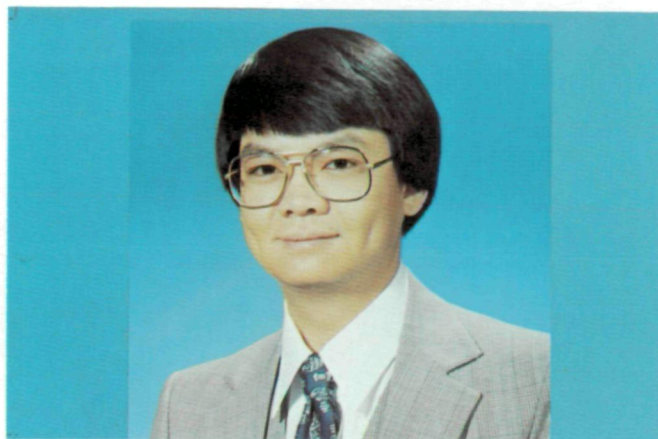
After World War II, my parents emigrated from China to Taiwan, where I was born and raised. When I was thirteen, my family came to the United States.

During this time, I spent hours building model airplanes and fantasizing about the day when I would design aircraft and perhaps pilot one of the planes I'd designed.

I've always had a strong desire to become an aerospace engineer because I felt that I could best serve my fellow man in that profession. I also liked the idea of earning an above-average salary while pursuing my great interest in aircraft design. My excellent grades in mathematics and science courses reflected a solid technical foundation which was necessary for studying engineering in college.

I paid for my college education by working as a part-time waiter in a restaurant. During my junior year, the college began a Cooperative Education Program. I heard about the program at the last minute and registered on the last day. When I joined the program, I elected work at NASA mainly because of my interest in aircraft. As it turned out, this simple step became a milestone in my life.

After my first Co-Op period, my interests switched from designing aircraft to studying power and energy conversion. I'm now the

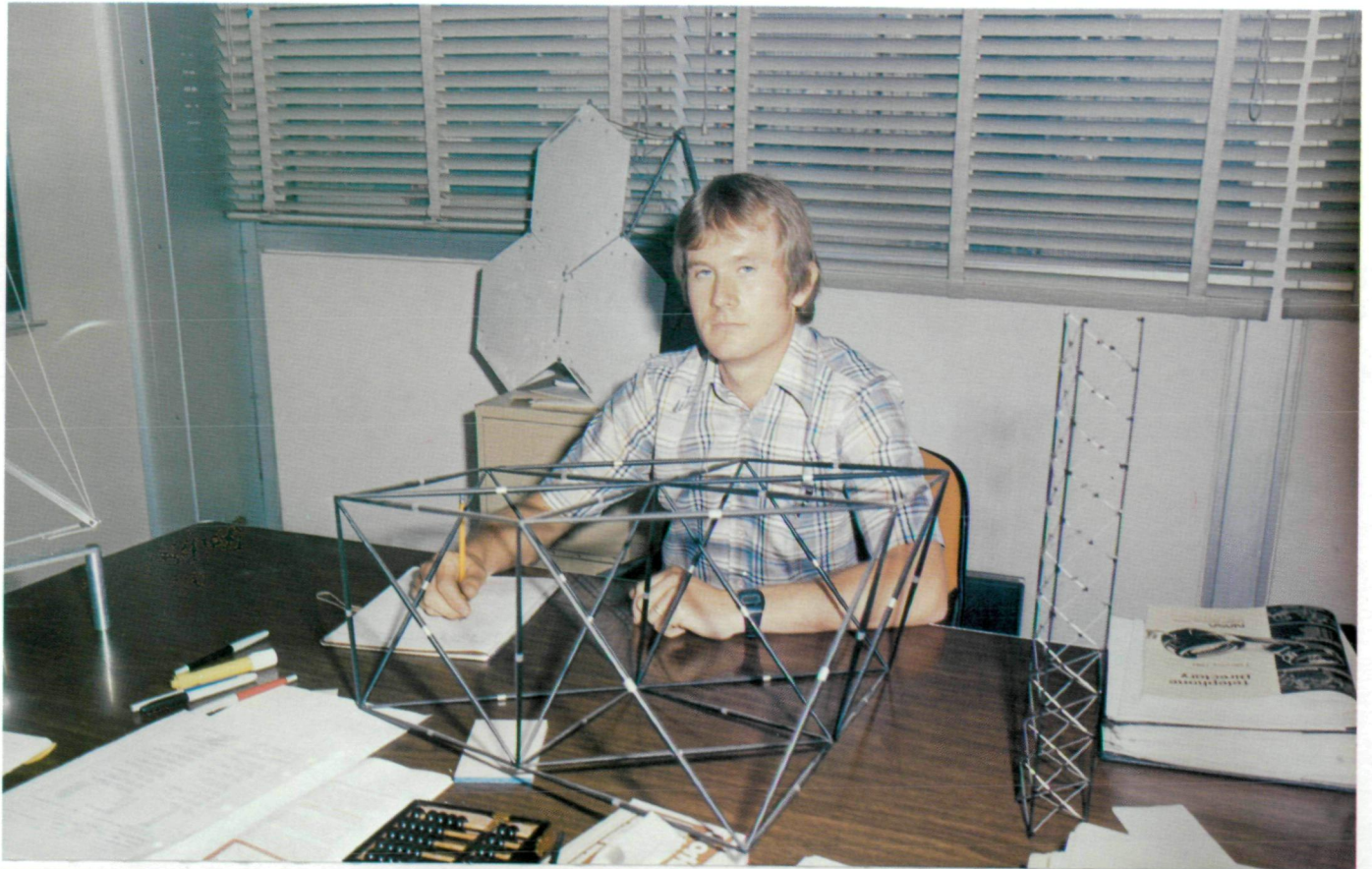


Technical Project Engineer for the installation of solar heating in a large building at our Center. My job helps save energy while improving our facilities. It's also a small contribution to solving the nation's energy problem.

I'm primarily interested in developing alternative sources of energy for general applications. I'm improving my proficiency in this area by attending graduate school in a NASA sponsored graduate program. I believe solar energy is the key to meeting mankind's energy needs.

The following suggestions have helped me achieve my goals and may help you, too. Earn good grades in subjects like mathematics, science, and English because you'll need these skills later in your career. Talk to your guidance counselor about career planning and selecting the college right for you. Get a part-time job, especially if you plan to pay your own way through college. Maintain a positive attitude about yourself because believing in yourself is very important. You can be anything you want to be, if you just put your heart into it.

John C. Lin
Mechanical Engineer



Our jobs are helping to make life safer and more exciting.

We're a husband and wife team of mechanical engineers. Although we majored in the same branch of engineering, our job assignments are significantly different. We can work on different problems because we've been trained to apply basic engineering principles to both design engineering and research development engineering. Mechanical engineering represents one of approximately 50 branches of engineering and is the broadest of all the engineering disciplines. Nearly one-fourth of all engineers in the United States are mechanical engineers.

I'm Lindy, one of the engineers who are designing a facility where aircraft landing gear, brakes, and tires will be tested. The facility will give test engineers the capability to simulate aircraft takeoff, taxi, and landing operations by controlling the forward speed and sink speed of the landing gear and runway conditions. These tests will enable research engineers to safely test existing landing gear systems and to design new and safer systems.

I began considering a career in engineering during junior high school. My guidance counselor suggested the possibility of an engineering career after reviewing my scores on several aptitude, ability, interest, and intelligence tests. My scores reflected a strong interest in applied math and science, the same interests of most engineers. During my senior year, I began working after school at a local NASA Center. This work experience familiarized me with the daily work assignments of engineers in the aerospace industry.

While Lindy's current work is related to aeronautics, I'm involved with space-related projects. I'm assessing the suitability of various types of



structures which will be deployed and erected in outer space. These structures may be a kilometer (.62 miles) in diameter – much bigger than Earth structures. In the near future, when the Shuttle is fully operational, manufacturing of exotic materials such as large silicon crystals for use in more efficient solar collector systems will become a reality. Large space structures will also be used to greatly advance our communication abilities.

I enjoyed working on mechanical systems, such as small engines, when I was in high school. Although mathematics was never my strongest subject, I have found that the behavior of most systems can be understood through the use of mathematical equations that describe the system. When I was in high school, I discussed my interests with engineers who strongly recommended an engineering profession. I took their advice and majored in engineering in college.

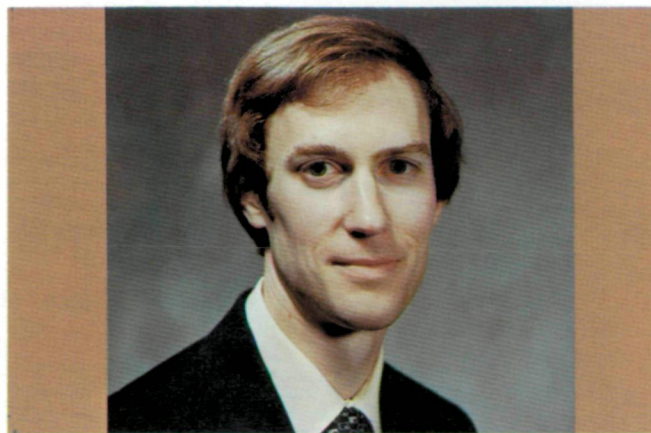
We've discovered that education does not end with the bachelor's degree; engineers must keep up with the expanding knowledge in their fields. NASA's graduate studies program is a great way for scientists and engineers to continue their education. NASA reimburses the employee for the tuition costs of the courses and permits him or her to take time off to attend classes while continuing to pay the employee's salary.

There is no limit to where the aerospace industry can take mankind. We feel our jobs are helping to make life safer and more exciting for all people.

*Lindy A. Belvin
W. Keith Belvin
Mechanical Engineers*



I've learned the value of completing a job through a patient step-by-step process.



When I was in grade school, my father introduced me to building model airplanes which were propelled by small engines. I found that I really enjoyed the challenge of carefully constructing and adjusting the models. During summer vacations from high school, I worked in a shop which made tools used to produce blades for aircraft jet engines. This work was even more challenging and required more patience than building model airplanes, since the dimensions of the finished tools had to be accurate to within a few thousandths of an inch. Through these experiences, I found myself intrigued by technical challenges, and I learned the value of completing a job through a patient step-by-step process. I still enjoy doing handwork as a form of relaxation, and I work with wood and stained glass as a hobby.

I direct the work of six engineers who perform design, analysis, and testing of axial flow fans and compressors. The fan and compressor assembly, the first major component of an aircraft jet engine, draws air into the engine and compresses it before passing the air into the combustor.

I measure the air flow within operating compressors with delicate optical instruments. Some of my measurements are taken with an instrument that uses lasers to optically measure the air velocity within the rotating fan and compressor blades. Part of my job includes programming computers to control the laser instrumentation and record and process the measurements. The results are then used to

develop computer programs which can predict the compressor flowfield. More advanced fans and compressors are designed with the assistance of computer programs.

My research contributes to a better understanding of how aircraft engines operate. This, in turn, increases our ability to design engines which operate more efficiently, are less expensive to build, are more durable, and perform as well as, or better than, previous engines.

I think it's important to study a broad range of academic courses during high school and the early years of college. In this way, you'll become a more well-rounded individual. You'll also be exposed to many different disciplines from which you can choose a career. I've discovered that my background in social studies has made me aware of society's needs and that my research has an impact on society. Courses in social studies have helped me recognize the importance of group interaction in achieving a common goal. This is an important factor in today's research, since most research projects are too complex to be performed by one individual.

If you find yourself questioning how something works or why it performs the way it does, and if you're motivated to seek solutions to problems, then I encourage you to pursue a career in engineering or science. I can assure you that either will offer you many challenging and rewarding career opportunities.

Anthony J. Strazisar, Ph. D.
Mechanical Engineer



*Every facet of my job is
exciting and fulfilling.*

I hope that just once in your life you'll have the opportunity to experience exhilaration like that which swept over me when I saw the Shuttle Columbia touch down after its maiden flight. Part of my thrill was knowing that my calculations and computer simulations had predicted the electrical power consumable requirements for the mission.

My analysis of the Shuttle's electrical power system (EPS) is similar to that of your local electric company when it calculates the number of kilowatt hours your family has used in order to determine your bill. The difference is that the supply of electricity to your home is relatively unlimited. The Orbiter, however, does not carry an unlimited supply of electricity. Three fuel cells supply its power. These three cells operate from a cryogenic (extremely cold) oxygen and hydrogen supply contained in pressurized tanks. If this supply is depleted to a "redline" quantity, the mission must be ended.

In order to perform a Shuttle electrical power system analysis, I must determine the vehicle electrical component configuration that will support the length of the mission, the proposed payload experiments and the activities of the crew. I must be certain that simultaneous experiments don't overload the power system and "blow a fuse." I use a computer program to simulate the exact mission that the astronauts will fly. This puts me in the



position of knowing about each switch that the crew will activate or deactivate throughout the mission. One of the most exciting aspects of my job is monitoring the Shuttle's systems during "real time" to determine if my pre-flight predictions closely approximated the vehicle's performance capabilities.

From the time I was in the third grade, I wanted to teach mathematics. I changed my mind, however, soon after I began my first work period as a cooperative education student at a NASA Field Center. My co-op work experiences were so rewarding and exciting that I continued with a major in mathematics and redirected my minors toward a science background, with the hope of being hired by NASA when I graduated.

During your preparation for a career in aerospace, I definitely recommend that you study foreign languages. We're entering the operational era of the Shuttle, and it will be advantageous for NASA personnel to converse with their foreign counterparts about payloads and their effects on the Orbiter's systems.

I really enjoy my job because it is always challenging, exciting, and diversified. I can't imagine any other job where each facet is more exciting and fulfilling than the one before!

Cynthia D. Wells
Aerospace Engineer



Aerospace technology solves existing problems and, in turn, creates new problems requiring more advanced technology.



I manage a large computer complex consisting of a wide spectrum of computers, ranging from very large machines holding approximately six million characters in memory to smaller machines holding fewer than 64,000 characters. These computers process the "science" data obtained by Earth-orbiting spacecraft.

Science data may contain measurements such as the concentration or vertical distribution of ozone in the atmosphere, assessment of flood damage or snow run-off, survey of land features which indicate possible oil formations, or crop growth and yield. Science data consists of hundreds of thousands to millions of bits per second. A bit (binary digit) is the smallest piece of processable information. Bits are assembled to form characters, words, or codes and represent the raw measurements or the data obtained remotely by a spacecraft. The bits are transmitted to the NASA Spaceflight Tracking and Data Network and then forwarded to the computer complex for processing. The processed data produce information used by scientists, engineers, and technicians to better understand certain phenomena of the Earth's atmosphere: water, ice, and land conditions, and details of topographical features which affect life on Earth.

The computer complex is designed to process three major types of data: image, non-image, and data from the Spacelab, which is being built by the European Space Agency. Image data are measurements made by "picture-taking" spacecraft such as Landsat and Nimbus 7. These data are processed to produce a picture of the Earth's surface.

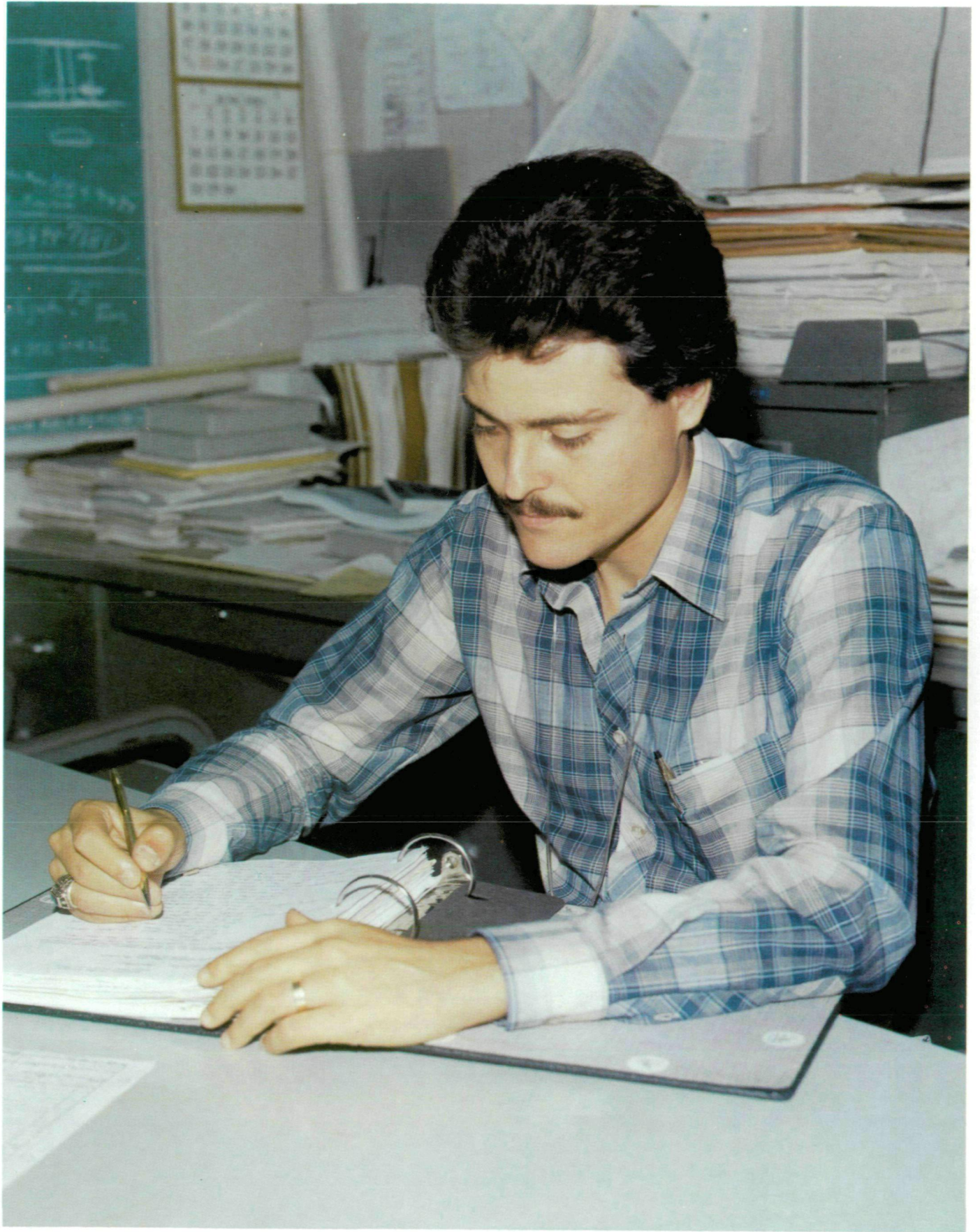
Non-image data processing includes the generation of plots and histograms indicating the concentration of water vapor, for example. Another task consists of converting a clock on board a spacecraft to universal time and the separation of science data for specific scientists.

The third major activity of data processing will be for Spacelab, which will contain the experiments of scientists from all over the world and will be carried into space and returned to Earth by the Shuttle.

My career in aerospace is rewarding because I enjoy understanding how things work, and I like to correct problems and work in new or unexplored science areas. My fascination with science-related activities led to my undergraduate degree in geology and my graduate studies in computer science.

My job at NASA Headquarters in Washington, D.C., is exciting and enjoyable because of my involvement with present programs, my job-related travel, and my contact with interesting people from other government agencies and industries. Future programs such as the Space Telescope enhance my excitement.

Joseph L. Bishop
Program Manager
Data Processing

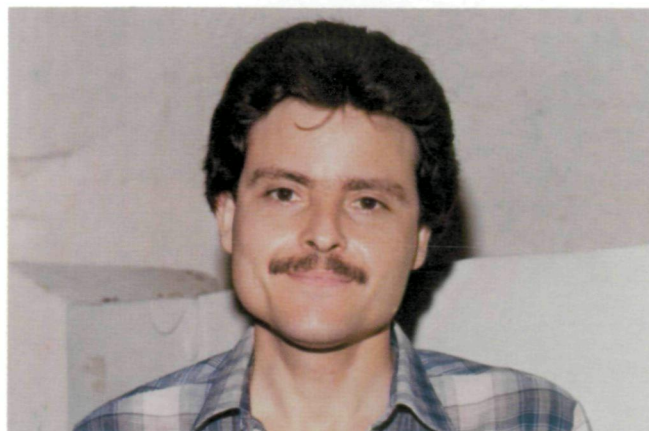


I became an engineer probably because I was always fascinated by how things work.

Have you ever wondered about how the pioneers who settled the West must have felt every time they successfully forged across a rugged mountain ridge or conquered the surging current of an uncharted river? My work as a civil engineer for NASA gives me a feeling similar to what they must have experienced. At NASA we explore areas never before investigated. We're now on the threshold of a new era of space exploration and utilization. I'm proud to be a member of the team responsible for creating the Space Transportation System. It's difficult for me to describe the sense of accomplishment and pride I feel when I observe the Shuttle roll majestically past me on its way to the launch pad.

My work fulfills a childhood dream of becoming an engineer. I've always been amazed by large pieces of machinery. Even now, I stop at construction sites to watch as the crew operates the heavy equipment.

I share responsibility for the application of the insulation on the outer surface of the Shuttle's external fuel tank. This insulation is part of the Thermal Protection System, which is required because the tank contains liquid oxygen and liquid hydrogen at cryogenic temperatures. Cryogenic temperatures for oxygen and hydrogen range from -263°F . to -425°F . Without insulation on the outside of the tank, much of the fuel would be



lost through boiling during loading and launch. The insulation is applied to the outside of the tank just like a thermos bottle in order to minimize the amount of fuel lost and protect the Orbiter's sensitive tiles from ice debris.

My second major area of responsibility has to do with the Solid Rocket Boosters. The Solid Boosters are made up of a series of eight cylindrical segments, approximately 27 feet long, weighing about 300,000 pounds each. They arrive by train and are then assembled at my Center until they are the proper length. My primary responsibility is to supervise the unloading and stacking of these segments. This includes the mechanical assembly of any fixtures, pieces, or parts that have to be physically attached to the boosters.

The best advice I can offer you about planning for a career in aerospace is to keep an open mind. Prepare, starting at the high school level, by studying advanced science and mathematics courses. Talk to people employed in the field and read about topics related to the aerospace industry. In other words, be informed.

Hector N. Delgado
Civil Engineer



I hope my computer programs are never needed!

Like many of my friends, I didn't give much attention to my career plans when I was in high school. It was obvious that mathematics was my strong subject, but it was not clear to me which occupation this ability would eventually lead me to select. I worried more about whether or not my team would win the next baseball game or whether our concert chorus would be selected to compete in the state contest.

It was not until my final year of college that I really made the decision to pursue a career with NASA. By this time, I had acquired an extensive background in mathematics and physics, and NASA was able to put these skills to work in the areas of Mission Planning and Trajectory Design.

Today I'm responsible for developing computer programs that are able to tell the Space Shuttle how to achieve a safe landing in the event of critical failures such as a main engine turning off prematurely. This puts me in the unusual position of hoping that my programs are never needed! The importance of this kind of planning was demonstrated during the Apollo 13 Mission. During that mission, the programs and procedures that I helped to develop were used to return the crippled spacecraft safely to Earth.



My job as an aerospace engineer is both challenging and rewarding. I know that I'm part of a team that is continually improving our nation's capabilities in space while contributing to our country's technological strength.

If you're interested in a career in aerospace engineering, plan to attend a college that offers a strong aerospace engineering curriculum. Course emphasis should be on engineering, mathematics, and computer science. It would also be good to consider summer or cooperative work programs offered by NASA and other large aerospace companies. My final advice is that you continue to pursue your hobbies and outside interests. Just make sure that they do not hinder your career goals.

Gordon L. Norbraten
Aerospace Engineer



I've always been interested in designing new products or improving existing ones.

From the time I was in grade school, I have enjoyed making things. In elementary school, I can remember designing and making special handmade arrows out of roof shingles. I could shoot these arrows skyward and out of sight using a sling made from a tree branch and rubber bands cut from old car tire inner tubes. Some of my shenanigans with my custom-made staple shooters got me into trouble at school. Instead of expelling me, one of my elementary school teachers decided that I needed more work to occupy my mind and she requested permission from my mother to give me additional projects. She assigned me extra reading in various science books because she recognized my talent in mathematics and my love for designing and making things with my hands. This teacher's influence was extended through my junior high school years as she made a point to monitor my progress by continuing to contact my teachers.

In high school my interest in making or improving things continued, but turned more to tinkering with mechanical things -- bicycles and old cars -- and I became a good mechanic. My best school subjects continued to be mathematics and science. During classroom contests, I was skilled at working mathematics problems faster and more accurately than most of my classmates. I was enrolled in a technical curriculum and took courses in advanced mathematics, physics and aeronautics. I also took several courses in English and Latin.

The thought of becoming an engineer never entered my mind until I was drafted into the Army. It became evident to my officers that I had a strong technical background as a result of some



of the tests given during training, and I was transferred to the Army Air Corps, where I passed the exam qualifying me for pilot cadet training. By this time I was thinking of going to college to become a mathematician. However, I became friends with a wise, older soldier who suggested that I consider engineering as a major subject with mathematics as a minor. When I was discharged from the Air Corps, I took my friend's advice and used the G. I. Bill to enroll in college with a major in aerospace engineering and a minor in mathematics.

After graduating from college, I pursued graduate studies and conducted aerospace research. While conducting wind tunnel studies of supersonic shock wave phenomena, I discovered that I could control the shock wave position in front of certain cylindrical-shaped bodies. This discovery resulted in a patent which I now have for a supersonic air data sensor for aircraft.

I'm now a manager for general aviation programs at NASA Headquarters in Washington, D. C. I find it very satisfying to manage the research of scientists and engineers who are involved with advanced technology developments which will be used on future general aviation aircraft.

Raymond E. Rose, Ph. D.
Program Manager
General Aviation Office



As an engineer, I solve problems in logical ways.

I'm helping to develop new techniques for improving the quality of data collected during wind tunnel tests. Improved techniques are necessary because the information generated during experiments in wind tunnels is applied to the design of future aerospace vehicles. If errors exist in the data, they might negatively influence the design and development of a vehicle. Months, or even years, of additional experimentation might be required to correct the problems resulting from these errors.

One way to improve the flow quality in a wind tunnel and, thereby, produce more accurate test data is to reduce the effects of wind tunnel walls on the flowfield. To reduce the interference caused by the walls, we're studying wind tunnel walls which can flex allowing the flow in the tunnel to achieve the same shape it would in an unenclosed space.

My job as an aerospace engineer is challenging because every day brings a variety of unusual problems associated with improving wind tunnel test data. Each problem requires the application of different aspects of my knowledge of engineering. As I piece together facts to solve these problems, I'm constantly learning and broadening my knowledge and technical skills. I'm also gaining additional technical knowledge as I work toward a master's degree in engineering in a graduate studies program sponsored by NASA.

When I was growing up, I knew I wanted a job requiring the use of my scientific and mathematical talents. I also wanted the job to be



prestigious and well paying. By observing my father, who was an electrical engineer, I realized that a career as an engineer would satisfy my vocational expectations. In addition, I observed that engineers solve problems through a process of practical, logical, and deductive reasoning. This rationality appealed to the practical aspects of my personality.

During my junior year in high school, I began considering the type of college I wanted to attend. I realized that selecting a college is an important step in the process of preparing for a career, and I wanted my choice to be one that would be satisfying. Features especially important to me included a reputable engineering department offering a wide choice of engineering disciplines and a college which offered a cooperative education program. Finally, I wanted to attend a college located in an area with recreational and cultural activities. I reviewed college catalogs and discussed the advantages and disadvantages of various colleges with my parents and other people. I made a final decision based on a logical decision-making process.

My career is rewarding. If you're technically oriented, I'd recommend that you seriously explore the possibility of becoming an engineer in the aerospace industry. One day you also may feel the satisfaction of contributing to the science of aeronautics.

Elizabeth B. Plentovich
Aerospace and Ocean Engineer



Aerospace workers are responsible for human lives and billions of dollars of equipment.



Microprocessors are the “brains” of computer systems. I use microprocessors and logical methods to design and build computers. Microprocessors are small integrated circuits — chips — about 1-1/2 inches by 3 inches in size. Today, one of these chips can perform jobs that in the past would have required a roomful of computers and far greater expense.

I assign instructions to a microprocessor, which, in turn, performs special tasks based on the instructions. For example, I’m designing a microprocessor-based computer that will monitor experiments to be conducted on board the Space Shuttle. Because of my background in this specialized field, I’ve been asked to work on assignments that usually require the expertise of older and more experienced engineers.

Most people begin making decisions about their careers during high school. I’d suggest that you learn about careers from lots of different sources besides the typical classroom. I discovered that Explorer Posts sponsored by the Boy Scouts are great ways to learn about careers. These posts can help you explore potential jobs that you might like and that are appropriate for someone with your interests, abilities, and personality. They also will give you the opportunity to learn about types of work that you don’t like and

jobs that are unsuitable for you. I was a member of a post in high school and I teach a post in computer science today.

I completed high school graduation requirements and began earning college credits when I was 16. In order to do this, I accumulated high school credits by attending summer school courses, and I attended college classes while still enrolled in high school.

While attending college, I began surveying the job market to determine what occupations would be available when I graduated. I wanted to select a college major that would prepare me for a well-paying job in a field which I liked and which promised many job opportunities. I discovered that there would be a demand for college graduates with a knowledge of microprocessors so I selected a major in electrical engineering with an emphasis on digital systems. When I graduated, I had no trouble finding a job. In fact, several employers offered me jobs.

To me, aerospace jobs offer the greatest challenges. There is no room for error in aerospace occupations because human lives and billions of dollars of equipment could be lost with just one mistake. I enjoy meeting these challenges to the best of my ability.

Gregory L. Distler
Electrical Engineer



Today we're turning yesterday's science fiction into tomorrow's fact.



I'm a trajectory analyst for NASA. The title "trajectory analyst" may be unfamiliar to you at first, but an example from the past may help you understand my job. Trajectory analysts are responsible for successful rendezvous missions like the historic Apollo-Soyuz Project. You may remember that two days after the launch of Soyuz, Apollo maneuvered into the same orbit, and the two spacecraft were docked. This successful docking was achieved as a result of the calculations computed by specialists like me.

My calculations are based upon mathematical equations, many of which were formulated hundreds of years ago. I think of these equations as mathematical symbols which describe the motion a satellite, such as the Shuttle Orbiter, will make as it rotates around the Earth. If I know the position and velocity of a satellite at any time, I can predict its position and velocity at a given time in the future by using these equations and computer programs.

At some time in the future, I will determine which maneuvers and motions will be required to rendezvous the Shuttle Orbiter with another satellite. This will involve writing computer programs that will help determine how to move the Orbiter from a distance of hundreds of miles from the satellite to within just a few feet of it. The ability to rendezvous the Shuttle with another orbiting body, such as NASA's Space Telescope, makes it a useful tool for erecting, maintaining, and repairing structures in space.

Typically, you'll find me working at my desk with a small computer terminal nearby. During

rendezvous missions, however, I'm in the Mission Control Center, where I advise flight controllers.

I've always been fascinated by the adventure of flying. I love the freedom I experience as I soar above the clouds. I have a private pilot's certificate for single-engine-land-based aircraft, and I fly about once a month.

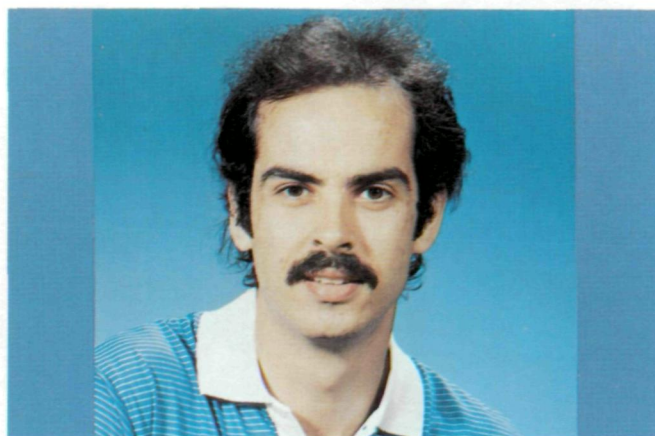
To me, aerospace careers require more than a strong background in mathematics, science, or engineering. They require an interest in aeronautics and space and, equally as important, a strong desire to be part of the new era of space utilization.

I equate the utilization and development of the space frontier, which is predicted to result from the Space Transportation System, with the expansion of America's western frontier which resulted from the transcontinental railroad. I predict that, during the era of the Space Shuttle, new types of jobs will be generated that are unfamiliar to us today. Specialists in medicine and pharmacology will devise ways to use the space frontier for the benefit of mankind on Earth. Mechanical and civil engineers will be challenged with the task of designing, fabricating, and erecting space stations and space platforms in zero gravity, which require different procedures than those used for construction on Earth. Today we're in the process of turning yesterday's science fiction into tomorrow's fact.

Allan L. Dupont
Aeronautical Engineer



*There's always something new
for me to learn in my job.*



Sparkling white, shivering cold, snow! When I was a teenager, I wondered what it would be like to play in the snow. You see, I was born and raised in Puerto Rico, an island with beaches of white sand, clear water, and lots and lots of sunshine.

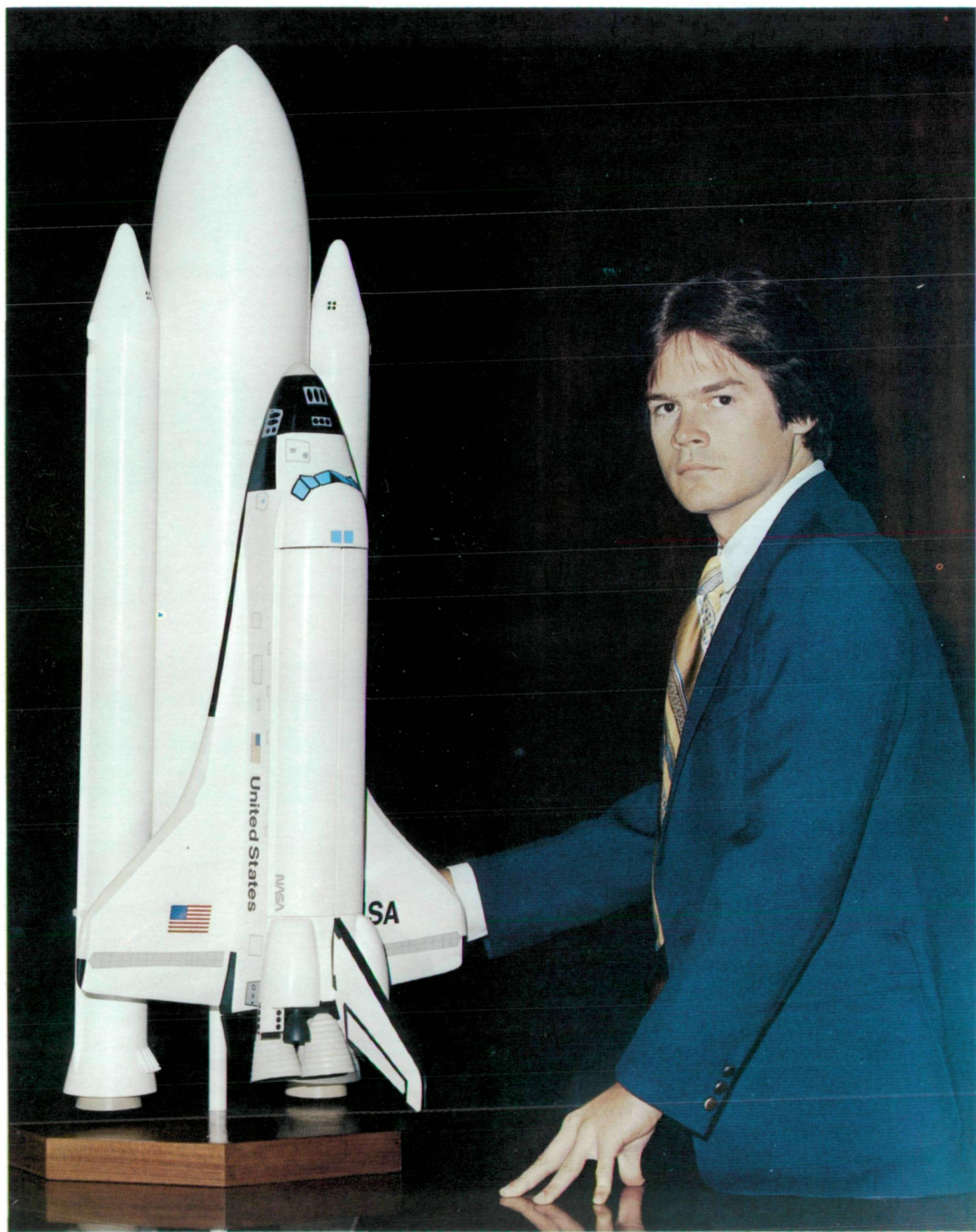
During my first week of work for NASA, my curiosity about snow was satisfied. A snow storm covered our area with a shining white blanket. Suddenly, a dull, cold winter had been transformed into a beautiful playground. I had so much fun playing in the snow that I had no time to be bothered by the cold.

Romping in the snow has been just one of the pleasures associated with my engineering work for NASA. Today, part of my job is to predict the behavior of objects when thermal energy — heat — is applied to or removed from them. I helped analyze thermal protection systems for the Space Shuttle, using as a tool one of the best computer facilities in the United States. Computers can perform millions of operations in just seconds, saving time and effort which can be applied to the solution of other problems. I have learned that even with the help of computers there are no simple solutions to “real-world” problems.

When I was in high school, my hobbies were assembling models of cars and airplanes. I also loved to take apart and examine all kinds of appliances. I wondered how they worked, and I asked myself how I could improve them. This natural curiosity was one of the factors that encouraged me to consider a career in engineering.

When I graduated from high school, I had to choose between a career in medicine or engineering. I decided upon a college major in engineering because I enjoyed engineering-related courses, and I knew I was a naturally curious person. I selected the speciality of mechanical engineering because it is one of the broadest and most versatile engineering fields. Today, I enjoy the variety of jobs that I can perform as a mechanical engineer. I never get bored because there's always something new for me to learn.

William M. Berrios
Mechanical Engineer



The challenges in aerospace are many; the successes are brilliant.



A storm of flame, smoke, and steam accompanied the Space Shuttle Columbia as it was launched into orbit. I'll never forget the excitement and satisfaction I felt as I watched Columbia rise above this storm which seemed to engulf the mobile launcher.

I work as a technical manager in the Executive Management Office at one of the NASA Centers. As a technical manager, I'm responsible for a variety of technical and administrative tasks. I "track action items." Basically, this means that I'm responsible for making sure that jobs which have been assigned to our personnel by the Center's Director are completed successfully. Sometimes I'm a public relations expert, and I meet with some exciting public figures. For example, during the first launch of the Shuttle, I served as an escort to the National Security Advisor and the Secretary of the Navy.

As you can see, my job is different from the others described in this publication. I majored in industrial engineering in college. Industrial engineering is different from other branches of engineering, which deal mostly with equipment and materials. Industrial engineers study ways to combine human factors with equipment in order to best fit human beings into the work environment. Frequently, industrial engineers are selected for managerial jobs because we've been trained to analyze work settings and then devise ways to increase the efficiency of

workers and their equipment in order to achieve the most effective production of goods and services.

As a college student, I entered a cooperative education program which existed between my college and NASA. I discovered that there are many advantages to being a co-op student. I gained valuable work experience which helped when I applied for a permanent job. I also earned an income which I used to pay some of my educational expenses. My real-life work situations required me to apply the theories I'd learned in classes. This, in turn, helped me better understand the classroom material. Co-op experiences provided me with opportunities to become familiar with several types of job assignments while I was still in college. Finally, living on my own during work periods taught me how to manage my budget and take care of myself.

A prerequisite for an aerospace career is a sincere interest in seeing that plans are transformed into successfully performed realities. I've discovered that the challenges in this industry are many, and the successes are as evident and brilliant as the maiden flight of Columbia.

Bryant Keith
Industrial Engineer



Engineers solve problems with creativity and inventiveness.

Imagine a huge commercial transport flying at 20,000 feet amidst a raging thunderstorm. Suddenly, the plane is struck by a lightning bolt! The pilot frantically struggles to stabilize the aircraft because the onboard flight-control computer system has malfunctioned because of the lightning strike.

Imagine this scene. A jumbo jet is descending smoothly toward the runway. For no apparent reason the plane drops from its flight path but finally manages to safely touch down.

NASA conducts research in order to understand and resolve problems like these. As electrical engineers, we're working to help prevent similar scenes from occurring in the future.

I'm Celeste, the twin on the left, and my research project involves studying the effects of lightning on airborne computer systems. Although the first situation is not a threat to today's aircraft, it may be a threat to the computer-controlled aircraft of tomorrow.

My job is to determine exactly what would happen inside an airborne computer if the plane is struck by lightning. To do this, I'm designing and building a laboratory test system. This system will inject a computer with electrical currents like those that would result from lightning and will record evidence



of malfunction in the computer. With my system, I can simulate in the laboratory what might happen in a real flight situation.

I'm Chris and my research project is related to the second problem. Studies show that the probable cause of crashes during the landing phase of flight is wind shear — sudden changes in the speed and/or direction of the wind.

My assignment is to analytically evaluate a pneumatic-electronic sensor that will detect wind shear. I'm developing the mathematical equations and computer program that will simulate the landing approach of a commercial airplane as it descends through various wind shear conditions. This simulation will be designed to model the aircraft's response to the signals of the sensor being evaluated.

Engineering is a fascinating field because it requires creativity and inventiveness to apply scientific principles to the practical solution of problems. Through engineering almost any idea can become a reality. Engineers strive to improve life by creating a safer and more efficient world.

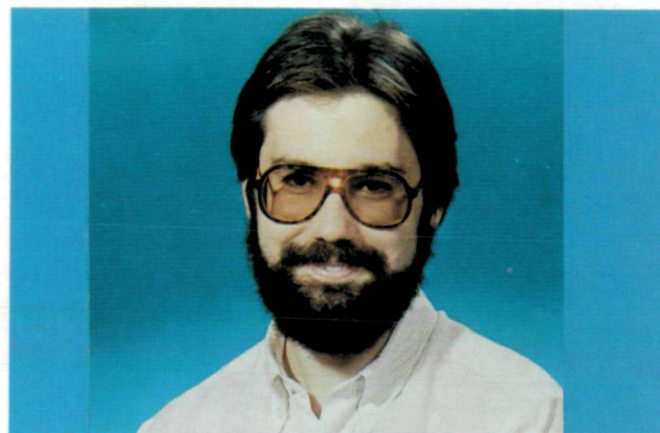
*Celeste M. Belcastro
Christine M. Belcastro
Electrical Engineers*



Mathematics and science are indispensable tools for engineers.

Do you like to travel? Have you ever visited Europe? While I was studying engineering in college, I enjoyed two all-expense-paid trips to Europe. My first trip was sponsored by the College of Engineering at my university as a way to reward the top ten percent of the junior class. The trip exposed us to Europe's technology and culture. While in college, I was also a member of the American Institute of Aeronautics and Astronautics (AIAA) which provided the means for my second European visit. AIAA does much to support student engineers. Once a year, it pays for student members from various universities to meet and exchange information at a regional student conference. A paper I presented at one of the regional conferences was judged the best space-related paper, and was then considered for submission to the student paper competition at the International Astronautical Federation conference in Munich, Germany. My paper was chosen and I spent ten days in Munich attending the conference, presenting my paper, and enjoying Germany.

When I think back to what influenced my career choice, I realize that it's not surprising that I became an aerospace engineer, since I've lived near airplanes all my life. Before I was old enough to attend elementary school, I'd listen for the roar of Air Force planes flying overhead and run outside to watch them flying only a few thousand feet above me. Because they flew so close to the tops of the trees, I was able to study their details and soon learned to distinguish one type of plane from another.



During high school, I enjoyed physics, computer science, and calculus. In my work, I've found that mathematics and science are indispensable tools for engineers, and I'd recommend that you take as many fundamental courses as possible in these areas until you're sure of your career field.

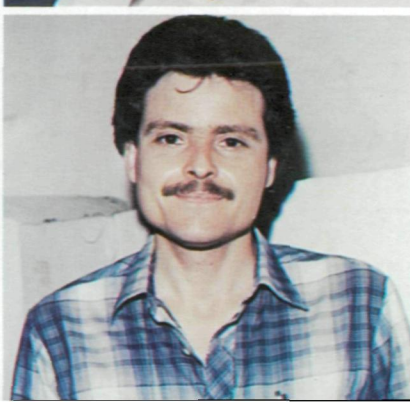
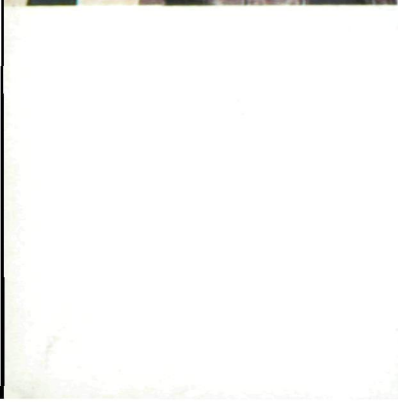
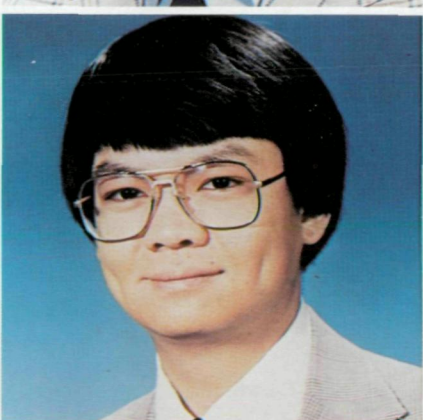
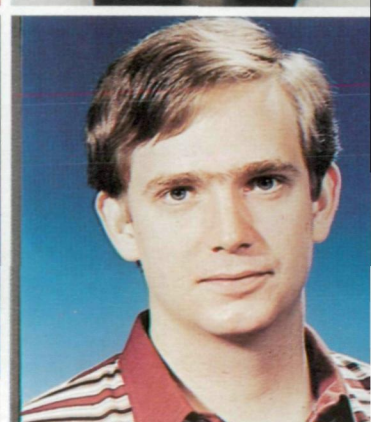
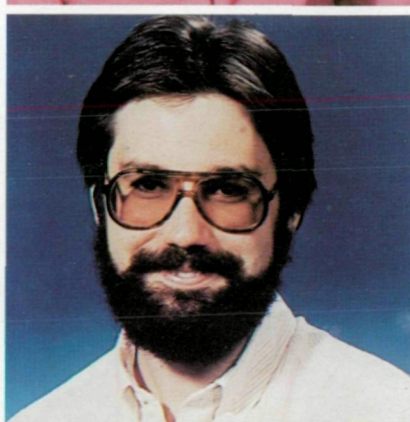
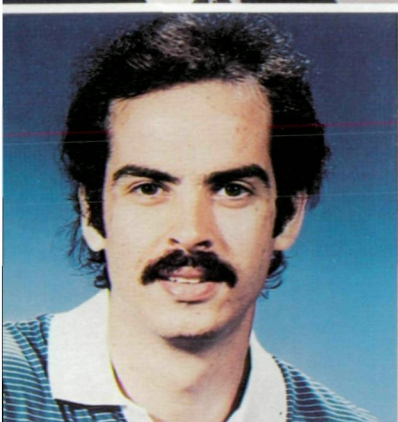
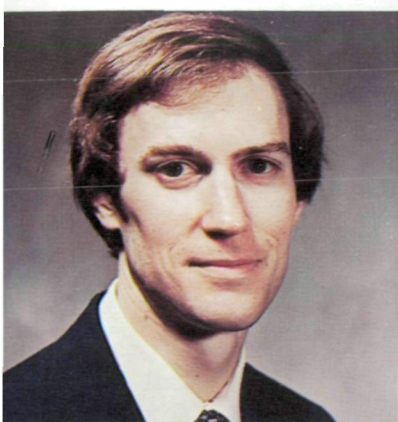
I decided to attend an in-state university because it offered a Co-Op program with NASA and the tuition was less expensive than either a private in-state university or an out-of-state university.

During college, I helped one of my professors with his research. During this time, I learned what a valuable tool the computer can be in modeling fluid flow. I gained more experience with computers during my Co-Op work periods and decided to concentrate my academic courses in the area of theoretical fluid dynamics.

As an aerospace engineer, I write computer codes which can model the air flow about an object. The use of these codes, in conjunction with wind tunnel results, helps engineers design more advanced, fuel-efficient transonic aircraft.

For me, there is no other career that could be more rewarding than engineering. If you plan to become an engineer, expect to study hard in college, and remember that it's a small price to pay for such a challenging and rewarding career.

N. Duane Melson
Aerospace and Ocean Engineer



While you're in high school,

there are many steps you can take to prepare yourself for a career as an engineer in the aerospace industry.

Discuss your career plans with your guidance counselor and teachers. They can tell you about the many different kinds of occupations available in this diverse industry. They can recommend special tests designed to help you determine your interests, abilities, and aptitudes. Be sure to plan your high school courses with their help.

As you plan your high school curriculum, there is a wide range of courses that will be helpful to your future career. Good grades in mathematics and science courses are a must. In addition to these courses, a well-rounded high school curriculum includes courses in English, social studies, and foreign language(s), as well as technical subjects like mechanical drawing. By studying a wide range of subjects, you'll be prepared to respond to unexpected opportunities. Participation in extracurricular activities and hobbies will expand your high school experiences and prepare you for the years ahead.

Be sure to seek the advice of people actually working in jobs of interest to you, and visit their work sites. Your friends, neighbors, and relatives can help as you consider various career choices.

Visit your school and public libraries for additional information about the thousands of different types of careers. Ask the librarians for the names of professional associations which you can contact for more information about specific careers in aerospace.

Part-time and volunteer jobs will expose you to daily work activities and responsibilities.

These suggestions are aimed at helping you prepare for a career as a tomorrow-minded engineer.

At this point if you'd like additional information about careers in aerospace, contact the Educational Programs Officer at the NASA Center serving your state. See below:

NASA Ames Research Center
Moffett Field, California 94035

serving: Alaska, Arizona, California, Hawaii, Idaho, Montana, Nevada, Oregon, Utah, Washington, and Wyoming

NASA Goddard Space Flight Center
Greenbelt, Maryland 20771

serving: Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont

NASA Johnson Space Center
Houston, Texas 77058

serving: Colorado, Kansas, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, and Texas

NASA Kennedy Space Center
Kennedy Space Center, Florida 32809

serving: Florida, Georgia, Puerto Rico, and Virgin Islands

NASA Langley Research Center
Hampton, Virginia 23665

serving: Kentucky, North Carolina, South Carolina, Virginia, and West Virginia

NASA Lewis Research Center
21000 Brookpark Road, Cleveland, Ohio 44135

serving: Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin

NASA Marshall Space Flight Center
Marshall Space Flight Center, Alabama 35812

serving: Alabama, Arkansas, Iowa, Louisiana, Mississippi, Missouri, and Tennessee

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